
BONE AND SHELL REMAINS FROM FORT ELLSWORTH, KANSAS

by

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INTRODUCTION

This section provides a description and assessment of faunal remains recovered from archeological investigations at Fort Ellsworth, Kansas. The excavations were conducted in 1995 and 1996 by the U.S. Army Corps of Engineers (Kansas City District) under the overall direction of Dr. Robert Ziegler. Much of the site is situated on Corps of Engineers property surrounding Kanopolis Lake in central Kansas. The site was determined eligible for the *National Register of Historic Places* following 1995 test excavations. Although located on government property, the site is in a remote area and its integrity and research potential are threatened by illegal collecting and excavation. The data recovery program was developed in response to increasing vandalism and included excavation of two dugout structures and a variety of test units on the knoll above the dugouts (Ziegler 1996).

Analysis of recovered bone and shell is an important aspect of the Fort Ellsworth research program. In addition to narrative and tabular descriptive treatment of the collection this analysis focuses on a variety of research questions. The most prominent include: 1) characterization of the Fort Ellsworth diet with respect to wild versus domestic meat, 2) butchering patterns and cuts of meat reflected in the sample, 3) variation between major analytic units and 4) placement of the Fort Ellsworth diet in regional and historical perspective.

LABORATORY PROCEDURES AND ANALYTIC UNITS

Following excavation, bone and shell debris was washed, cataloged and segregated from other material classes by Kansas State Historical Society staff. Their specimen inventory lists the frequency of fragments for each provenience but individual pieces were not labeled with catalog numbers. The sample was submitted to the author during the spring of 1997 and at that time the collection was packaged in individual containers labeled with relevant provenience information and catalog numbers. All sorting and bone identification was completed by the author. Trish Nelson identified the shell remains.

Materials from each provenience unit were segregated into identifiable and unidentifiable lots. Potentially identifiable specimens were labeled with catalog numbers and subdivided into the following

categories for further treatment: cattle, swine, deer or pronghorn, small mammal, reptile/amphibian, egg shell, mussel shell, bird and fish. Several fractured specimens were glued but other formal stabilization measures were not taken.

The collection is well preserved and the proportion which could be identified is high. A specimen was considered identifiable if the element, side and portion could be determined and assigned to a taxonomic grouping at the family level or below. Most remains were identified through comparison with modern reference collections in possession of the author as well as those curated by the Nebraska State Historical Society and the National Park Service (Midwest Archeological Center) both in Lincoln, Nebraska. Variables recorded for each identified item include: catalog number, provenience, taxon, element, side/portion and various comment fields. Comment fields noted natural or cultural characteristics such as burning, butchering marks, meat cut value, erosion and gnawing by rodents or carnivores. Immature specimens were also noted. These data were placed in a computerized database (Microsoft Access) using a coding format designed for use with archeological faunas (Falk et al. 1979).

The identified portion was quantified using the number of identified specimens (NISP) and minimum number of individuals (MNI) for each taxon. MNI values were tabulated using the standard method of determining the element, side and portion that occurs in the greatest frequency for a given taxon (Grayson 1984). Relative age was also taken into consideration. NISP and MNI values were calculated for the sample as a whole and NISP counts re-tabulated by various gross analytic units identified by project staff. Analytic units producing faunal remains include: Depression 10, Depression 13, Knoll, Flats, and Surface.

RESULTS

The Fort Ellsworth vertebrate sample is composed of 3445 fragments weighing 12,399.3 grams (Figure 1). Of these, 449 pieces weighing 105 grams were retrieved from flotation processing. Six-hundred and thirteen fragments proved identifiable using criteria noted above. By weight the identified bone sample constitutes 71.1% of the entire collection and includes 21 taxonomic groups representing a minimum number of 29 individuals. Modified bones were not recovered. The bone collection is very

well preserved with minimal surface erosion. Erosion that did occur is a product of weathering and to a lesser extent gnawing by rodents and carnivores. These agents however do not appear to have made a serious impact on the ability to identify remains. Bone fragmentation is largely a function of butchering practices although the actions of gnawing carnivores and rodents were occasionally noted.

The unidentifiable portion of the collection, 2832 specimens (3596.9 grams), is summarized by analytic unit in Table 1. Unidentifiable debris was not systematically tabulated by class (bird, fish, mammal, reptile, amphibian) but the vast majority is small fragments of large mammal bones. Trace amounts of bird, fish, and smaller mammals were noted. By weight over 93% of the unidentifiable bone debris were recovered from Depression 13. Non-bone materials within the sample include small amounts of egg, mussel, and gastropod shell. Full inventories of shell and bone remains are on file at the Kansas State Historical Society.

Shell

The eggshell remains could not be identified but they almost certainly are chicken -- which comprise 97% of the identified bird bones. By weight over 85% of the eggshell was recovered from flotation processing. Eggshell distribution is provided in Table 2. The sample is composed of 2545 fragments weighing 29.5 .6 grams. By weight, eggshell is nearly evenly divided between Depressions 10 and 13.

Other shell remains include mussel shell and gastropods and they are summarized in Table 3. The combined gastropod and mussel collection is comprised of 160 fragments weighing 98.4 grams. Nearly 95% of these are mussel shell valves, valve fragments and unidentifiable pieces. Most of the sample is unidentifiable (66% by number and 38.3% by weight). Identified taxa include: *Uniomereus tetralasmus* (pond-horn mussel), *Lampsilis* sp. (sand mussels), and possibly species of *Proptera*, *Quadrula*, and *Fusconia*. Some specimens were identified as only members of the Unionidae family. Inadequate reference collections prevented identification of the gastropod sample.

Interestingly, much of the identified mussel sample is represented by species that now inhabit portions of Kansas somewhat to the east and southeast of the Fort Ellsworth area (Murray and Leonard

1962). It is also noteworthy that most mussel remains were recovered from the Knoll area, not Depression 13 where most of the bone originated. Procurement of mussels by the military on the Great Plains is not well documented -- but it certainly is for the Central Plains prehistoric tradition (Wedel 1986:230). Although the origin of the shell sample from Fort Ellsworth is unclear they spatially co-occur with Smoky Hill phase material and are likely related to this precontact Native American component. The modern geographic distribution of taxa represented may indicate slightly moister conditions during the Smoky Hill phase occupation.

Identified Vertebrate Remains and Distribution

The 613 identified bones are assigned to 21 fish, reptile, amphibian, bird or mammal taxonomic categories (Table 4). Table 5 is a summary of the identified remains by analytic unit. Table 6 provides summary information on modifications observed on the identified bone sample. Depression 13 yielded nearly 78% of the identified sample followed by Depression 10 (16.3%) and the Knoll (4.6%) with trace amounts from the Flats and the site surface. The sample is dominated by cattle bones (55% by NISP and 90.4% by bone weight). Other relatively common taxa include: swine (NISP=13.5%), box turtle (5.0%), chicken (5.4%), and cottontail rabbit (10.4%). The remaining taxa constitute no more than 1.8% of the identified sample.

Fish

The fish assemblage is comprised of six *Lepisosteus* sp. (gar) elements -- one from Depression 13 and five from the Knoll area. The sample includes five scales and one cranial fragment and represents about 1% of the combined identified assemblage. These remains are not sufficient to make a specific taxonomic determination. Four unidentified fish bones were recovered from Depression 13 and one of those is burned. Fish were obviously a minor component of the Fort Ellsworth diet.

Reptile

Thirty-one reptile bones (5.0% of NISP) were recovered and all are identified as "probably" *Terrapene ornata* (ornate box turtle). The possibility the remains could be from the osteologically similar *T. carolina* (Florida box turtle) could not be eliminated, however the modern range of this southeastern species extends westward only to about 100 miles southeast of the project area (Conant 1975: maps 28-32). All turtle remains were recovered from Depression 13 and a minimum of only one individual is represented. The remains were scattered about the feature however and more than one individual likely was present. The sample is comprised chiefly of plastron and carapace fragments although a few limb elements were recovered.

Amphibian

A single non-specific Bufonidae (toad) pelvic element was recovered (.2% of the combined sample). Toads which inhabit the project area today include (Conant 1975: maps 252-271): *Scaphiopus bombifrons* (Plains spadefoot toad), *Bufo woodhousei* (Woodhouse's toad), *Bufo cognatus* (Great Plains toad), and possibly *Bufo americanus* (American toad).

Bird

The avian sample includes 47 elements from three taxa constituting about 7.7% of the combined identified sample. Bird bones are dominated by domestic chicken (76.0%). Thirty-seven chicken bones were recovered representing a minimum of four individuals. This is the highest MNI value for the Fort Ellsworth sample. Twenty-seven bones were recovered from Depression 13 and five from Depression 10. Modifications noted on the chicken sample include: burning (4), carnivore chewing (1), and knife marks (7). One specimen is from an immature individual and three are poorly preserved. All of the skeleton is represented but the sample is dominated by leg and wing portions. Breasts and back elements are relatively rare.

Other identified birds include: Galliformes (grouse, prairie chicken, domestic chicken, quail etc.) and Icteridae (meadowlark/blackbird family). The generalized Galliformes material include nine heavily eroded lower leg bones from what appears to be a single individual recovered from Depression 13. The

poor physical condition of these remains prevented a definitive distinction between domestic chicken and one of several similar wild forms. Historic sources indicate Ft. Ellsworth soldiers did hunt prairie chicken. The Icteridae bone is a humerus collected from Depression 13.

Small Mammal

Eight small or medium-sized mammal taxa were identified. These include: Soricidae (shrew family), *Sylvilagus floridanus* (cottontail rabbit), *Lepus* sp. (jackrabbit), Cricetidae (native mice), *Microtus* sp. (vole), *Rattus* sp. (domestic rat), Carnivora (carnivore), and *Mephitis mephitis* (striped skunk). Combined, these materials represent 12.7% of the identified bone. Of these, 62 elements or 81.0% are cottontail which reflects a minimum number of three individuals. Except for the skunk bones, cut marks or burning were not observed on these materials. A skunk tibia from the Knoll carries knife marks and a femur from Depression 13 has an entrance and exit wound from what appears to be a single shotgun pellet. Single examples of cottontail and jackrabbit bones have been rodent gnawed.

Nearly all of the cottontail and jackrabbit bones originated within Depression 10 as did the vole and carnivore bones. Depression 13 produced the shrew bone, two cottontail bones, one jackrabbit bone, and all of the domestic rat bones. The skunk sample was recovered from Depression 13 and the Knoll.

Based on contemporary distribution (Cockrum 1952:96-101), the jackrabbit bones could be either *L. californicus* (black-tailed jackrabbit) or *L. townsendii* (white-tailed jackrabbit). Voles in the project area include: *M. ochrogaster* (prairie vole) and *M. pennsylvanicus* (meadow vole) although the former is much more common (Cockrum 1952:201). The rat remains could be either *R. norvegicus* (house or Norway rat) or *R. rattus* (black rat). Today only the former occurs in Kansas but both species could be found in the area during the 19th century (Cockrum 1952: 208-210). The two species of shrew which inhabit central Kansas (Cockrum 1952:40-47) are *Blarina brevicauda* (short-tailed shrew) and *Cryptotis parva* (least shrew). The Fort Ellsworth specimen appears to be from the former. The carnivore element is a single tooth fragment which is likely from a small dog or coyote, fox, raccoon, or badger.

Large Mammal

About 72% of the identified sample is large mammal remains. The collection consists of 439 elements representing a minimum of nine individuals assigned to seven taxa. Three hundred and thirty-six bones are identified as *Bos taurus* (cattle). Historic accounts indicate soldiers stationed at Fort Ellsworth hunted bison from time to time. Accordingly, a concerted effort was made to identify any bison remains. Cattle and bison rib, vertebra, and long bone diaphysis fragments are indistinguishable. Others such as long bone articular ends, carpals, and tarsals do have subtle distinguishing characteristics. Despite close examination, bison remains were not identified although the osteological similarity between bison and cattle is subtle and the presence of small amounts of bison can not be confidently eliminated.

Three hundred and fifteen (93.7%) of the cattle bones were recovered from Depression 13. The remainder originated within Depression 10 (8 elements), the Knoll (12 elements), and the surface (1 element). Modifications to cattle bones include: burning (34 elements), rodent gnawing (7 elements), carnivore gnawing (72 elements) and butchering marks (160 elements). In addition, 114 specimens are from immature animals and 49 are in fair or poor condition.

Other large mammals identified include *Sus scrofa* (swine), *Odocoileus* sp. (white-tailed or mule deer), *Antilocapra americana* (pronghorn antelope), and *Capra/Ovis* (sheep or goat). These materials are represented by 103 elements and about 80% of those are swine (83 bones). Swine bones are most common from Depression 13 although a few specimens were collected from Depression 10. Deer and pronghorn bones were recovered from all major analytic units but in very low frequencies. The single sheep/goat bone was found in Depression 13.

Characteristics recorded for the swine sample consists of : burning (1), rodent gnawing (3), carnivore gnawing (10), butchering marks (29), immature specimens (58), and poor/fair condition (15). None of the other large mammal bones are burned but six deer and pronghorn elements carry cut marks, two are gnawed by carnivores, one is from an immature animal, and eight are poorly preserved.

Human Remains

Eleven human bones were recovered during the Fort Ellsworth investigation. The sample consists of two teeth, a fragmented thoracic vertebra, a first rib, and seven hand bones. The human bone was retrieved from various excavation units in the Knoll area. The human remains may only represent a single individual however one digit has a partially fused epiphysis. This could be accounted for by either: 1) more than one individual or 2) differential fusion rates within the same skeleton. Origin and cultural affiliation of these remains are not clear. They were found scattered in several excavation units suggesting they may originate from a previously disturbed burial. Only the incisor is potentially biologically diagnostic and it does not appear to have the distinctive shovel-shape typical of many Native American populations. These remains should be closely re-examined by a physical anthropologist.

DISCUSSION

Sample Origin

The overall well preserved nature of the collection suggests bone was rapidly buried following disposal. The vertebrate collection is comprised principally of remains present as a direct result of human subsistence activity. Large domestic mammals make up nearly 70% of the sample by number and 96.6% by bone weight. Other taxa which are linked to dietary activities include: chicken (including eggshell), deer, and pronghorn. At least one skunk bone exhibits evidence of hunting although contribution to the diet is problematic. The rat bones are certainly related to human occupation but it is very unlikely they relate to subsistence pursuits. Most of the recovered subsistence sample was retrieved from intentionally placed refuse deposits. Other species which may have been subsistence items include: gar, turtle, rabbit, jackrabbit, and carnivore although direct evidence such as burning and butchering marks were not observed. It is also possible some of these taxa died naturally at the site or were introduced by carnivores. The occurrence of toad, perching bird, shrew, and vole is even more likely a function of natural processes. The bulk of the sample is affiliated with the mid 19th century occupation of Fort Ellsworth, however a Native American (Central Plains tradition) component was also discovered at the site area. Deer, pronghorn, rabbit, gar, turtle, skunk, mussel shell, and carnivore have

all been documented from Central Plains tradition hamlets (Wedel 1986; Bozell 1991; Koch 1995) and some of the Fort Ellsworth remains could be linked to this prehistoric occupation.

The distribution of fauna is consistent with functional interpretations of Fort Ellsworth proveniences. The bulk of the bone originated within Depression 13 which is the ruins of a living quarters. Dense bone deposits in and around the feature would be expected in such a setting. It is noteworthy however that over 50% of the Depression 13 fauna was retrieved from stratigraphic levels above the "floor" of the quarters. This situation may indicate a portion of the sample was deposited as refuse from other locations at the Fort following abandonment and collapse of this dugout. Depression 10 is a bakery. Obvious subsistence items include small amounts of chicken, swine, cattle, and possibly pronghorn bones. The low frequency of these remains is consistent with occasional consumption of meals by bakers at work. The majority of the cottontail and jackrabbit bones were recovered from the bakery but their relationship to the diet of people working in the structure is unclear. The composition of the Knoll fauna is rather similar to Depression 10 and characterized by a few cattle, deer, and pronghorn elements -- again possibly related to occasional meals consumed by soldiers working in and around the structure.

The origin of the human remains on the Knoll is not clear. They either relate to a Central Plains tradition burial disturbed by previous vandalism or construction and use of the Blockhouse by the military or are the remains of a soldier or later Euroamerican settler in the area. The scattered distribution of the remains suggests the burial was disturbed prior to the present archeological investigation.

Native and Domestic Fauna

Based on the present investigations, Fort Ellsworth occupants overwhelmingly relied on domestic animals for meat. The faunal profile is typical of Euroamerican military, urban and rural contexts with over 70% of the identified specimens attributed to domestic forms. These bones reflect animals that were either raised on-site or arrived as butchered and processed meat (Eakins 1924). The fort was strategically located at the juncture of two important transportation and supply routes enabling soldiers

garrisoned there to have ready access to meat and other goods. Native fauna such as deer, pronghorn and perhaps rabbits and gar reflect limited hunting and fishing activities by Fort Ellsworth soldiers in the immediate vicinity of the post.

The absence of positively identified bison bone is somewhat curious. Fort Ellsworth soldiers hunting buffalo and other mammals and birds is well documented archivally (Baer 1996:11,43). Although these activities are frequently mentioned in historical documents, the comments typically refer to hunting while on patrol or escort duty away from the fort. Consequently, while a significant portion of protein may have been supplied by hunting, much of the game was killed, butchered and consumed in the field with little bone and meat returned to the post. This may be particularly true of bison. With apparently ample supplies of beef, pork and other food available at the fort, perhaps there was little incentive for soldiers in the field to make a regular and concerted effort to return wild game from the field, particularly large bulky buffalo portions. Also, only a small portion of Fort Ellsworth was excavated and other unexcavated features may contain larger and more diverse assemblages of wild game remains.

Butchering and Cuts of Meat Represented

This discussion defines swine and cattle carcass reduction patterns practiced at Fort Ellsworth and at butchering facilities supplying the post. The location of butchering marks was noted during identification and they are dominated by saw and cleaver marks but occasional knife cuts were observed (Figure 2). Knife marks are more common on swine remains and sawn and chopped elements more frequent within the cattle sample. Gust (1983) noted a similar pattern within California urban faunas and attributed the pattern to the relative thickness and hardness of cattle bones in comparison to swine. Heavily crushed diaphysis shafts are frequent among Fort Ellsworth bovid and swine remains. Smashed diaphyses are also common in frontier Euroamerican samples such as trading posts and early homesteads -- a pattern likely related to marrow extraction. Meat processing by the U.S. Army sought to maximize yields. Not only did carcasses produce meat but bone was cooked to extract oil, tallow, and grease (Eakins 1924:112-114).

The frequency of butchered swine bones (34%) is not significantly lower than cattle (48%). For both, the most common butchering marks are left by cleavers and saws through one end of ribs, long bones and vertebra. Elements sawn on both ends are significantly less frequent for both species. Tables 7 and 8 cross-tabulate skeletal portion against cut type. The most frequent swine sawing is observed on vertebrae and a few long bones. Ribs and most long bones display knife and cleaver marks. These values are consistent with standard military butchering practices of first dividing the hog carcass in half with a saw along the belly and vertebra axis. This is referred to as "packer dressing" and was typically performed at packing houses prior to shipment. Further carcass reduction was also done at packing houses using smaller tools. Over 80% of pork was smoked or salted before shipment to field posts (Eakins 1924:204). Most secondary post butchering was completed with knives, axes, and cleavers (Eakins 1924:194, 195, 204-214). Even as early as the 1820s, a significant portion of military pork products on the central Plains was barreled (Bozell 1997).

A wider variety of cattle bones are sawn than are swine bones. Ribs are the most often sawn but saw marks were also regularly recorded on vertebrae and limb elements. Knife marks are fairly rare on the cattle sample but cleaver or other chop marks occur frequently on ribs, vertebrae and some long bones. When beef was shipped to outposts, it was minimally quartered with saws. Beef may also have been processed into secondary divisions such ribs, foreshank, brisket, and hindshank (Eakins 1924:130-147). Frontier army posts typically maintained cattle herds in addition to partially processed meat arriving overland or, after the 1860s, by rail. Thus even primary slaughtering and initial processing were likely done on-site. Much of the secondary butchering on the Fort Ellsworth cattle sample appears to have been done with heavy cleavers when separating flank and brisket from ribs. Ribs, which are common at Fort Ellsworth, were most often processed with saws.

Meat cut categories were established from a variety of U.S. Department of Agriculture manuals and historic-era zooarcheological research project sources (Eakins 1924; Hurlburt 1977; USDA 1977, 1983; Levie 1979). Generally, the higher grades are represented by lumbar and thoracic vertebrae, medial ribs, pelvis, scapulae and upper limb bones. Lower value cuts are reflected by lower leg, neck and cranial elements. Sample frequencies were segregated into major meat cut portions for swine and

cattle (Figures 3 and 4 respectively). The swine sample indicates a distinct preference (or availability) for high grade pork roasts and chops with lesser amounts of hams, ribs, bacon, and stews. Despite this, all major cuts are represented at some level.

Thirteen beef cuts are reflected in the Fort Ellsworth cattle sample. The most frequent are bones reflecting short loin, short ribs, chuck roast, foreshank, rib roast, sirloin, and tenderloin. Lesser amounts of the following cuts are represented: arm, hindshank, neck stews, beef round, rump roast, and short plate. The cattle sample was also divided on a scale based on ten meat value ranks (Figure 5) defined by Huelsbeck (1991). Rank 1 is the highest value and Rank 10 the lowest. The most common cuts include: short loin and ribs (high value cuts), chuck roast and short ribs (mid-level cuts) and stew and shank portions (low value cuts). The poorest represented cuts include round and rump roast, brisket, and head and feet portions.

Whether cattle and swine were raised and processed in or along the margins of Fort Ellsworth or imported from some distance, can not be determined with available data. Small slaughterhouses and feed lots often supplied western military posts. Feed lots sold livestock to the military or butcher shops and the meat further processed for soldiers. Much of the swine sample is brittle and slightly discolored suggestive of materials which have been salted or smoked prior to shipment. The cuts of domestic meat indicate soldiers at Fort Ellsworth enjoyed a diverse assortment of beef and pork (as well as chicken) dishes. They certainly were not restricted to a consistent diet of low quality cuts. This situation further indicates the post was well supplied with either livestock or a wide variety of processed meats.

External Comparisons

The sample is adequate to offer impressions of the Fort Ellsworth meat diet in broader historical context. The sample was cross-tabulated against six other central Great Plains military and civilian Euroamerican assemblages (Figure 6) including: Fort Manuel (South Dakota fur trade post [1812-1813]; Mundell 1981), Fort Atkinson (eastern Nebraska military post [1820-1827]; Mundell 1979), Fontenelle's Post (eastern Nebraska fur trade post [1820-1840]; Bozell 1997), Fort Scott (southeastern Kansas military post [1840s and 1850s]; Reynolds 1983), Rock Creek Station (southeastern Nebraska stage

station [1860s]; notes in possession of the author), and Lead (western South Dakota mining town [1876-1930]; Bozell 1996) A distinct, yet rather predictable, pattern emerges. The earliest Euroamerican settlements in the region like Fort Manuel were supported almost entirely by procurement of wild game -- particularly large mammals. The introduction of chickens, swine, and cattle began in the 1820s at both military and civilian establishments throughout the region, however the intensity of domestic subsistence use varied rather sharply between military and civilian sites. By the 1820s, nearly 50% of the fauna from Fort Atkinson was from domestic animals. The trend toward increasing domestic animal use continued steadily for the military sites and by the time Fort Ellsworth was occupied in the 1860s nearly 75% of the fauna is from domestic animals. cursory examination of faunal samples from 1890s features at Fort Robinson in northwest Nebraska revealed domestic bone portions at over 90%.

The civilian sites also indicate significant reliance on domestic animals but the adoption of the strategy was slower than it was for the military. Fontenelle's trading post was occupied at least a decade after Fort Atkinson but has nearly 25% less domestic fauna. Forts Scott and Ellsworth have 60-75% domestic fauna but Rock Creek Station (1860s Oregon Trail road ranch) produced only 50% domestic fauna. It was really not until *after* the frontier period that civilian sites produce domestic faunal profiles similar to military posts. For example features from very late 19th century Fort Robinson and South Dakota Black Hills mining towns such as Lead yield faunas with over 80% domestic fauna. By the 1870s, the character of Euroamerican subsistence in the central Plains had shifted dramatically from a hunting based economy to a market economy. This change took place within the span of about a generation -- from 1850-1880 -- and the military implemented these shifts before pioneers and fur traders.

SUMMARY AND CONCLUSIONS

The faunal assemblage recovered from archeological investigations at Fort Ellsworth consists of over 3500 bone and shell fragments and about 2500 eggshell fragments retrieved from a variety of proveniences including building ruins and midden deposits. Over 600 pieces were identified to a taxonomic grouping at the family level or below. The identified fraction is dominated by cattle, swine, and chicken with reduced amounts of deer, small mammals, mussel shell, fish, and birds. The sample is

well preserved and the portion which could be identified is high. There is little reason to suspect a significant portion of the fauna deposited at Fort Ellsworth has decayed away. Some erosion, rodent gnawing, and carnivore gnawing was observed but these factors did not seriously affect the ability to identify and interpret the sample. Other than eggshell, flotation processing did not produce a significant amount of faunal material.

The large domestic mammal meat portion of the diet included a variety of high, medium, and low value cuts dominated by beef with smaller amounts of pork. Preferred portions include beef ribs, roasts, loins, and flanks and pork ribs, roasts, and chops. Poultry and eggs were also consumed with some regularity. Evidence of wild game procurement is limited although deer, pronghorn, rabbit, fish, and turtles occasionally added a little variety to the diet. Historic accounts clearly document hunting wild game by Fort Ellsworth soldiers although much of the bone debris from these activities may have been left at field camps and kill sites.

Documents relating to military subsistence suggest many posts were regularly supplied with partially or partially processed meats – beef, pork, and chicken – as well as a variety of other foodstuffs. Fort Ellsworth was situated on a major supply route and a significant amount of meat likely arrived at the post partially butchered and much of it was probably barreled. Post personnel probably further butchered imported meats for individual rations. In June of 1866 a private stationed at Fort Ellsworth was detailed as a butcher in the commissary department (NA 1865-1869: Special Orders No. 69, 19 June 1866). The post also apparently maintained livestock. Archival documentation is scant regarding on-site livestock however an 1869 post inspection noted that "The Beef cattle at the Post are very thin, there is much complaint made as to the quality of the Beef" (NA 1865-1869: E Otis to J. Davidson, 10 January 1867).

Butchering marks observed on cattle and swine remains were left by knives, cleavers (or other chopping tools), and saws. A high proportion of cattle bones were modified by saws and cleavers. Swine materials more often exhibit knife marks although they too display saw and cleaver marks. A significant portion of the sample is small crushed diaphysis splinters suggesting cattle and swine were also processed for production of grease, oil, and tallow. Bone processing offers further suggestion some stock was raised and processed on site.

Over 90% of the unidentifiable debris and 78% of the identified elements were recovered from Depression 13 – a dugout identified as a living quarters. Small amounts of bone were recovered from Depression 10 (a bakery) and the Knoll. The only remains which do not occur with regularity in Depression 13 are mussel shell fragments and human bone. These materials were recovered primarily from the Knoll area which also is the location of a Central Plains tradition component. This prehistoric Native American occupation may be the source of the human and shell remains.

The Fort Ellsworth fauna is consistent with 19th century American West vertebrate procurement patterns. The Fort Ellsworth diet, dominated by beef with lesser amounts of pork, chicken and wild game, is similar to that recorded for military and post-settlement civilian sites throughout the central Great Plains. Such a pattern is in rather sharp contrast to fur trade and early pioneer sites of only a generation earlier whose inhabitants were squarely focused on broad spectrum hunting.

Fort Ellsworth fauna adds to a growing body of data regarding the military economy of the central Great Plains. Several avenues of further research are evident in the event additional structures are excavated. Samples from other dugouts would have the potential to identify variability in hunting, butchering, and dietary patterns across functional and military rank lines. For example, faunal remains have the potential to identify differential diets between officers and enlisted men. Similar data could be gathered for proveniences associated with civilians. Needless to say, sampling any off-post camps would be very useful in determining the character of wild game procurement. Further assessment of historic documents, particularly those relating to food inventories and shipment, in light of the faunal study would be productive.

The interface between history and historical archeology has not always been a fruitful one and practitioners have expressed dissatisfaction with the apparent lack of recognition of the potential archeologists and historian have by sharing methodological approaches and data with one another. How this problem developed and has persisted is not difficult to understand. Archeological and historical data are much different breeds of information and often can lead to incongruous interpretations.

Interpretation of fur trade, military, pioneer, and urban subsistence systems have not been spared although concerted efforts to meld the two types of data together into coherent statements have

been attempted. In some instances, historical documentation has corresponded remarkably well with zooarcheological data, yet this is not always the case. The utility of using both types of information is that they serve to verify and augment one another and provide a basis for interpretation refinement.

Historical documentation regarding the present study provides a general characterization of subsistence patterns. Statements by soldiers, civilians, and visitors to the post offer insight into the several major patterns in operation during the occupation such as raising and importation of domestic stock and hunting. The archeological data does not come into serious conflict with historical documentation but taken together they enhance detail. For example, we know domestic meat played a major role in the post diet but the archeological information was required to determine what types of cuts were being eaten and processing strategies. The character of the faunal assemblage has also aided in functional definition of excavated features. The sample is entirely consistent with the assumption of the two major excavated areas being a quarters and a bakery. The faunal analysis does fall short in determining the role of hunting wild game. The small sample of native species recovered probably inaccurately reflects the level of hunting done by soldiers stationed at Fort Ellsworth. The magnitude of hunting carried out by Fort Ellsworth personnel remains perhaps the most important unresolved subsistence related research question

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FIGURE CAPTIONS

- 1) Percent of bone weight by analytic unit.
- 2) Percent of cattle and swine bones with butchering marks.
- 3) Major meat cuts reflected by swine bones.
- 4) Major meat cuts reflected by cattle bones.
- 5) Food value rank for identified beef remains.
- 6) Comparison of major taxonomic classes from Fort Ellsworth and select other sites.

Table 1. Summary of unidentifiable bone debris recovered from Fort Ellsworth.

Analytic Unit	Number	Grams
Knoll	50	55.4
Knoll (Flot)	24	1.5
Depression 10	143	121
Depression 10 (Flot)	16	1
Depression 13	2170	3314
Depression 13 (Flot)	348	46.7
Flats	35	56.8
Flats (Flot)	46	.7
TOTAL	2832	3597.1

Table 2. Eggshell recovered from Fort Ellsworth.

Catalog Number	Analytic Unit	Grams	Number
67	Depression 13	.1	1
69	Depression 13	.1	1
580	Depression 13	1.1	45
587.2	Depression 13	.1	4
665	Depression 13	.1	8
673	Depression 13 (Flot)	.4	40
778	Depression 13 (Flot)	.6	70
897	Depression 13 (Flot)	.5	48
898	Depression 13 (Flot)	.3	39
924	Depression 10	.1	6
926	Depression 13 (Flot)	1.3	131
930	Depression 13	.4	8
1003	Depression 10	1.5	11
1013	Depression 13	.1	11
1040	Depression 10 (Flot)	4.5	432
1044	Depression 13 (Flot)	.1	15
1054	Depression 13 (Flot)	1.8	196
1058	Depression 13 (Flot)	.3	22
1060	Depression 13 (Flot)	16.1	1466
TOTAL		30	2545

Table 3. Inventory of shell recovered from Fort Ellsworth.

TAXON	UNKNOWN	LEFT VALVE	RIGHT VALVE	GRAMS
Unionidae		5	4	6.6
cf. <i>Lampsilis</i> sp./ <i>Unio</i> merus sp.			1	0.3
cf. <i>Proptera</i> sp./ <i>Lampsilis</i> sp.		2	1	11.0
cf. <i>Quadrula</i> sp./ <i>Fusconia flava</i>		7	4	40.0
cf. <i>Lampsilis</i> sp.		1		0.6
<i>Unio</i> merus <i>tetralasmus</i>			2	7.0
gastropods	8			0.5
small valves	10			1.0
unidentified fragments	115			31.4
TOTAL	133	15	12	98.4

Table 4. Summary of identified vertebrate remains from Fort Ellsworth.

TAXA	NISP	MNI
<i>Lepisosteus</i> sp. (gar)	6	1
cf. <i>Terrapene ornata</i> (box turtle)	31	1
Bufonidae (toad)	1	1
Galliformes (chicken, grouse etc)	9	1
<i>Gallus gallus</i> (domestic chicken)	37	4
Icteridae (blackbird, meadowlark etc)	1	1
Soricidae (shrews)	1	1
<i>Sylvilagus floridanus</i> (cottontail)	62	3
<i>Lepus</i> sp. (jackrabbit)	3	1
Cricetidae (native mice)	3	1
<i>Microtus</i> sp. (vole)	2	1
<i>Rattus</i> sp. (rat)	4	1
Carnivora (carnivore)	1	1
<i>Mephitis mephitis</i> (striped skunk)	2	1
<i>Sus scrofa</i> (swine)	83	1
<i>Odocoileus</i> sp. (deer)	3	1
<i>Antilocapra americana</i> (pronghorn)	10	1
<i>Bos taurus</i> (cattle)	336	3
<i>Capra/Ovis</i> (goat/sheep)	1	1
<i>Odocoileus/Antilocapra</i> (deer/pronghorn)	6	1
<i>Homo sapiens</i> (human)	11	1
TOTAL	613	29

Table 5. Summary of identified Fort Ellsworth vertebrates by major analytical unit.

TAXA	Depression 10	Depression 13	Knoll	Flats	Surface	TOTAL
<i>Lepisosteus</i> sp. (gar)	0	1	0	5	0	6
cf. <i>Terrapene ornata</i> (box turtle)	0	31	0	0	0	31
Bufonidae (toad)	0	1	0	0	0	1
Galliformes (chicken, grouse etc)	0	9	0	0	0	9
<i>Gallus gallus</i> (domestic chicken)	6	31	0	0	0	37
Icteridae (blackbird, meadowlark etc)	0	1	0	0	0	1
Soricidae (shrews)	0	1	0	0	0	1
<i>Sylvilagus floridanus</i> (cottontail)	60	2	0	0	0	62
<i>Lepus</i> sp. (jackrabbit)	2	1	0	0	0	3
Cricetidae (native mice)	0	2	0	1	0	3
<i>Microtus</i> sp. (vole)	2	0	0	0	0	2
<i>Rattus</i> sp. (rat)	0	4	0	0	0	4
Carnivora (carnivore)	1	0	0	0	0	1
<i>Mephitis mephitis</i> (striped skunk)	0	1	1	0	0	2
<i>Sus scrofa</i> (swine)	12	71	0	0	0	83
<i>Odocoileus</i> sp. (deer)	0	0	1	1	1	3
<i>Antilocapra americana</i> (pronghorn)	8	0	2	0	0	10
<i>Bos taurus</i> (cattle)	8	315	12	0	1	336
<i>Capra/Ovis</i> (goat/sheep)	0	1	0	0	0	1
<i>Odocoileus/Antilocapra</i> (deer/pronghorn)	1	4	1	0	0	6
<i>Homo sapiens</i> (human)	0	0	11	0	0	11
TOTAL	100	476	28	7	2	613

Table 6. Summary of modifications recorded on the Fort Ellsworth vertebrate sample.

TAXA	Burning	Rodent Gnawing	Carnivore Gnawing	Cut Marks	Immature Specimen	Poor/Fair Condition
<i>Lepisosteus</i> sp. (gar)	0	0	0	0	0	0
cf. <i>Terrapene ornata</i> (box turtle)	0	0	0	0	0	0
Bufonidae (toad)	0	0	0	0	0	0
Galliformes (chicken, grouse etc)	0	0	0	0	0	9
<i>Gallus gallus</i> (domestic chicken)	4	0	1	7	1	3
Icteridae (blackbird, meadowlark etc)	0	0	0	0	0	0
Soricidae (shrews)	0	0	0	0	0	0
<i>Sylvilagus floridanus</i> (cottontail)	0	1	0	0	2	7
<i>Lepus</i> sp. (jackrabbit)	0	1	0	0	0	1
Cricetidae (native mice)	0	0	0	0	1	0
<i>Microtus</i> sp. (vole)	0	0	0	0	0	0
<i>Rattus</i> sp. (rat)	0	0	0	0	2	0
Carnivora (carnivore)	0	0	0	0	0	1
<i>Mephitis mephitis</i> (striped skunk)	0	0	0	1	0	0
<i>Sus scrofa</i> (swine)	1	3	10	29	58	15
<i>Odocoileus</i> sp. (deer)	0	0	1	1	1	0
<i>Antilocapra americana</i> (pronghorn)	0	0	1	1	0	5
<i>Bos taurus</i> (cattle)	34	7	72	160	114	49
<i>Capra/Ovis</i> (goat/sheep)	0	0	1	0	0	0
<i>Odocoileus/Antilocapra</i> (deer/pronghorn)	0	0	0	4	0	3
<i>Homo sapiens</i> (human)	0	0	0	0	1	4
TOTAL	39	12	86	203	180	97

Table 7. Inventory of butchering marks recorded on Fort Ellsworth swine bones.

ELEMENT	Knife	Cleaver	Single Saw	Double Saw	Composite
Mandible	0	0	0	0	1
Cervical	0	0	0	0	0
Thoracic	0	0	4	0	0
Lumbar	0	3	3	1	1
Sacrum	0	0	0	0	0
Rib	3	4	1	0	2
Scapula	0	1	0	0	0
Humerus	1	0	1	0	0
Pelvis	0	1	0	0	0
Femur	1	0	0	0	0
Tibia	0	0	0	0	0
Fibula	0	1	0	0	0
Metapodial	0	0	0	0	0
Digit	0	0	0	0	0
TOTAL	5	10	9	1	4

Table 8. Inventory of butchering marks recorded on Fort Ellsworth cattle bones.

ELEMENT	Knife	Cleaver	Partial Saw	Single Saw	Double Saw	Composite
Atlas	0	1	0	0	0	0
Axis	0	1	0	0	0	0
Cervical	0	8	0	1	0	0
Thoracic	0	15	0	0	0	0
Lumbar	3	20	0	10	0	0
Sacrum	0	1	0	0	0	0
Costal	0	0	0	0	0	0
Sternebra	0	0	0	0	0	0
Rib	6	10	3	29	7	6
Scapula	0	1	0	2	1	0
Humerus	0	2	0	1	1	0
Ulna	0	2	0	3	0	1
Radius	0	3	0	3	0	0
Radius/Ulna	0	0	0	0	0	0
Carpal	0	0	0	1	0	0
Pelvis	0	2	0	2	6	0
Femur	0	1	0	3	0	0
Patella	0	0	0	0	0	0
Tibia	0	0	0	3	0	0
Tarsal	1	0	0	0	0	0
Digit	0	0	0	0	0	0
TOTAL	10	67	3	58	15	7











